5. *(a)* *(i)* With a neat sketch of circuit diagram, explain how op amp can be use as adder and subtractor.

(ii) Explain slew rate and concept of virtual ground.

(iii) An inverting amplifier has $R_1 = 10\ k\Omega$ and $R_f = 100\ k\Omega$. Find output voltage and input current. (3+3)+3+3=12

(OR)

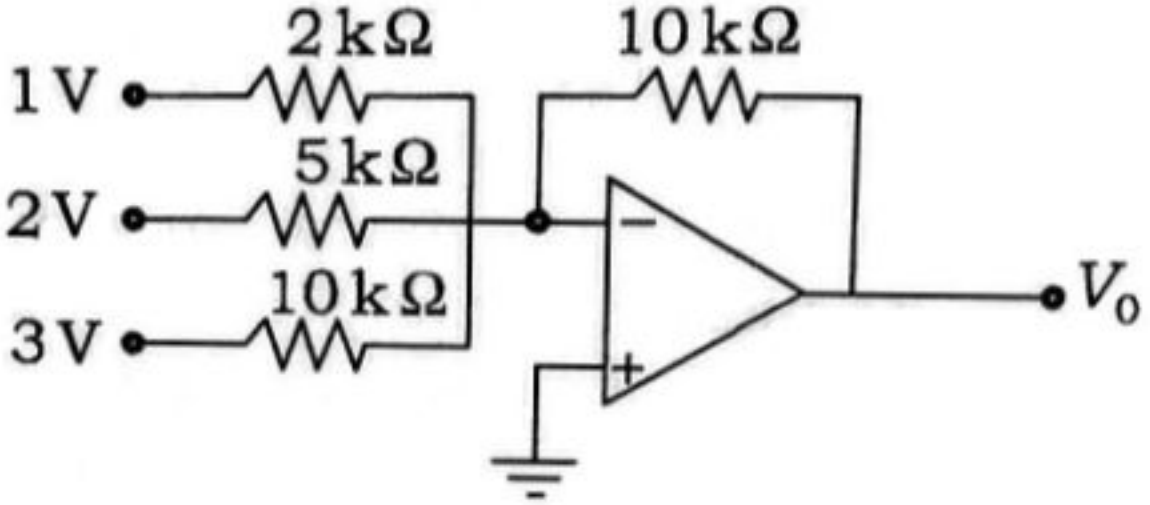
$I_f = \frac{V_i}{R}$.

(b) *(i)* Explain how op amp can be used as Log amplifier.

(ii) With a neat circuit diagram of Wein Bridge oscillator, explain its operation.

(iii) Define voltage gain, differential voltage gain and common-mode voltage gain.

(iv) Calculate the output voltage from the following fig. : 3+3+3+3=12



of 4.5V for an

the output for an input code 1110.

2+4+4+2=12

5. (a) (i) What is the CMRR of an OP AMP?

(ii) What is meant by Virtual ground of an OP AMP?

(iii) Discuss with circuit diagram, the use of OP AMP as an integrator and differentiator.

(iv) A differential amplifier has different mode gain $Ad = 5000$ and $CMRR = 1000$. Find the output voltage for input $V_1 = 200\ \mu V$ and $V_2 = 190\ \mu V$.

2+2+(3+3)+2=12

Or,

(b) (i) Show how OP AMP can be used as an adder and integrator.

(ii) Draw a circuit diagram of wien bridge oscillator using OP AMP. Determine the frequency of oscillation.

(iii) Calculate the actual output voltage of an integrator after 2 sec. for an input voltage of 1 volt. d.c. Given that the resistance at input = 100 kΩ, feedback capacitance = 7μF and the power supplies = ±12 volt.

(3+3)+4+2=12.